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The Economics of Crime: An Analysis of Crime Rates in America

Abstract

The purpose of my paper is to determine what factors are significant in determining fluctuations in the crime rate over time.

The Economics of Crime: An Analysis of Crime Rates in America

Alison Oliver

I. Introduction

A growing concern across the nation is the heightened incidence of criminal and violent behavior. There has been a steadily increasing trend in the crime rate over time until the 1990s, where the trend begins to fall off (Figure 1). However, the fluctuations have been a historical pattern since 1960, and the causes of them remain unexplained. Since the publication of Gary Becker (1968), the economics profession has analyzed the determinants of criminal behavior from theoretical and empirical points of view. The growing public awareness is justified because rampant crime and violence may have pernicious effects on economic activity and, more generally, because they directly reduce the quality of life of all citizens who must cope with the reduced sense of personal and proprietary security. Past research is based on models that look at the incentives faced by individuals to commit crimes, and possible causes of the persistence of crime over time (criminal inertia). I will discuss the elements factoring into the individual decision to commit a crime in my theory section. Then I will use the national crime rate over time in order to predict a reduced-form analysis of the country's aggregate individual decisions. The purpose of my paper is to determine what factors are significant in determining fluctuations

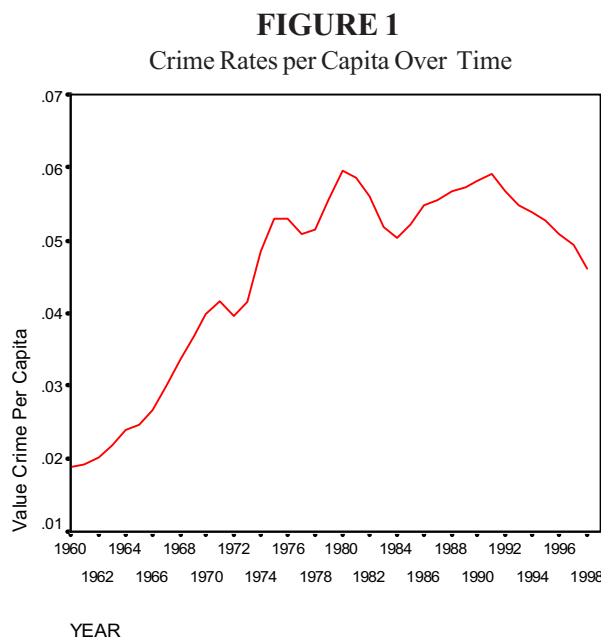
in the crime rate over time.

The rest of the paper will be organized as follows. Section II provides a selective review of theoretical and empirical contributions to the economics literature dealing with criminal behavior. Section III presents the economic model I will be using, and an explanation of the variables and my hypotheses for their effects on the crime rate. Section IV presents the results of the regression and how they are related to the research hypotheses. Finally, Section V indicates the major conclusions of the paper and policy implications derived from my findings.

II. Theory and Literature Review

The theoretical framework behind my paper is based on Becker's Rational Choice model, where an individual's decision to commit a crime is

based on the costs and benefits (1968). In this model, all potential criminals have a benefit of crime (b), includes both the financial and any expected psychological benefits of crime. An individual committing crime faces costs from law-enforcement activities. The severity of the punishment including fines and jail time is one part of the total cost, and the other part is the probability of getting caught. Therefore, the costs will equal



the probability of punishment (p) times the cost of punishment (c). Thus, the net expected returns from crime equal:

$$b - pc$$

Standard differentiation tells us that the number of criminals rises as b rises, and falls as p or c rises. Therefore, the individual decision to commit a crime is conditional upon the following stipulation:

$$(b - pc) > 0 \quad (1)$$

Crime reduction can occur through reducing the benefits of crime, raising the probability of being caught, or increasing the costs of punishment conditional upon being caught.

The theoretical model Becker sets up takes into account benefits, costs, and probability of paying those costs. However, opportunity costs seem to be absent from his model. Isaac Ehrlich analyzes the effects of income levels and distribution on crime in 1973. He argues that pay-offs to crime, especially property crime, depend primarily on the “opportunities provided by potential victims of crime,” as measured by the median income of the families in a given community. He also considers the effect of unemployment on crime rates. He views the unemployment rate in a community as a complementary indicator of income opportunities available in the legal labor market. However, in his empirical study, he finds that unemployment rates are less important determinants of crime than income levels and distribution. These variables are a measure of opportunity cost (o) which could be added to Becker’s model (equation 1): $b - (pc + o)$.

Another factor Ehrlich (1973) discusses, which relates to the effect of economic conditions on the opportunity cost of crime, is the level of education of the population. Education helps to determine the expected rewards from both legal and criminal activities. However, after controlling for income inequality and median income, Ehrlich finds a positive and significant relationship between the average number of school years completed by the adult population (over 25 years) and particularly property crimes commit-

ted across the U.S. in 1960 (1973). He explains this in two different ways. One being that as education increases a criminal can enter into higher paying sectors of crime. However, a more probable theory is explained, especially in connection with property crimes. As a nation’s average educational attainment increases, income will increase and the payoff of property crimes increases, thus increasing criminal’s benefits (b). However, it is expected that without the controls for income, an increase in education could be associated with higher expected legal earnings and thus increase the opportunity cost of committing a crime (o).

Together with the relationship between economic conditions and crime, one of the main issues in the pioneering studies of Becker (1968) and Ehrlich (1973) is the assessment of the effects of police presence, convictions, and the severity of punishments on the level of criminal activity. Individuals who are considering whether to commit crimes are assumed to

evaluate both the risk of being caught and the associated punishment. Their empirical evidence confirms that both factors have a negative effect on crime rates.

Analysts often make a subtle distinction between the “deterrent” effects of policing and convictions, and the “incapacitation” effects of locking-up (or killing, in the case of capital punishment) criminals who may have a

tendency to rejoin the crime industry once they are released. Deterrence essentially aims at modifying the price of crime for all offenders (increasing p and c). While incapacitation acts through the removal of a subset of convicted offenders from the market for offenses either by relocating them in legitimate labor markets, or by excluding them from the social scene for prescribed periods of time.

Steven Levitt (1999) addresses these issues jointly with one of the most recurrent problems in the literature mentioned above. The author attempts to assess whether the apparent negative relationship between crime rates and arrest rates are the product of deterrence effects, incapacitation, or measurement errors associated with the fact that crime tends to go unreported. The author finds that most of this negative relationship in the U.S. is due to deterrence effects (increases in p and c), and not measurement

“Crime reduction can occur through reducing the benefits of crime, raising the probability of being caught, or increasing the costs of punishment conditional upon being caught.”

error or incapacitation, for most types of crime.

The economics literature on crime has progressed from an emphasis on economic conditions (including education) and deterrence effects to more recent considerations of factors that may explain how crime is propagated over time and within communities. In the next section, I will organize some of the ideas from the literature in a simple framework.

III. Empirical Model

For the empirical testing of crime rates, I use the adapted rational choice model (equation 1) to build a model in which the dependent variable is the United States National crime rate (CRIME) and the explanatory variables are a number of national economic and social characteristics. A summary of these variables is presented in Table 1. They are separated into three groups: Economic Variables, Deterrence Variables, and Demographic Variables. The Economic Variables look at the opportunity cost side of the theoretical model, arguing that certain factors contribute to the decision of whether crime is worthwhile. The Deterrence variables test the cost side of the theoretical equation as well as the probability of getting caught. The significance of these variables will have important policy implications on crime prevention. The final group consists of only one variable (AGE), and is referred to as the Demographic Variable. The AGE

variable is the percentage of the population between the ages of 14 and 25. Criminologists often find in their studies that this age group has the highest propensity to commit crimes, so including this variable will give insight to who the prevention policies should be geared towards.

For my research I use a log-linear regression analysis on national time-series data of the United States. In a linear-log model, the dependent variable is unchanged but the independent variable appears in logarithmic form. This model was chosen because the relationship between the Crime Rate per capita and the independent variables is non-linear. Specifically, the marginal effect of the independent variables on the Crime Rate per capita, is increasing at a decreasing rate. This fitted curve can then be extrapolated to generate forecasts of the dependent variable, which is beneficial in policy implications.

A. Economic Variables

The first variable included is education level, which may impact the decision to commit a crime in several ways. The measurement used for education is the percent of the population that graduated from high school. Higher percentages of the population that have received a high school diploma (EDC) may

TABLE 1
Descriptions of Variables

Symbol	Definition	Standard Deviation	Mean	Expected Sign
CRIME	United States National Crime Rate (1960-1998)	.01304	.0452	
Economic Variables				
EDC	Percent of population that completed High School	11.4754	67.3222	?
ENRL	%of population enrolled in secondary school	.02318	.2231	-
GDP	Real GDP per capita	5105.901	21628.33	-
GINI	The Gini Index	.02602	.3788	-
UNEMP	Unemployment Rate	.2552	1.7696	+
Deterrence Variables				
PLC	Police Rate - number of police per capita	.05950	5.3864	-
INCAR	Incarceration population	110.969	263.6364	-
LGRTE	Lagged Crime Rate per capita	.01304	.0452	+
Demographic Variables				
AGE	%of Population under 25	.1100	1.8223	+

Source: FBI Uniform Crime Reports, the Bureau of Economic Analysis, the World Bank, and the National Center for Educational Statistics

be associated with higher expected legal earnings, thus a higher opportunity cost of committing a crime (o). Education through its civic component may also increase the individual's moral stance. On the other hand, education may reduce the costs of committing crimes or open opportunities for an individual to enter higher-paying crime industries. Hence the net effect of education on the individual's decision to commit a crime is ambiguous. It is possible however, that school enrollment (ENRL) alone will reduce the time available for participating in the crime industry, and therefore have an inverse relationship on crime rates. ENRL is specifically the percent of the population enrolled in secondary school. Thus, the empirical model will assess the effect of both secondary enrollment rates and educational attainment on crime rates.

The level and growth of economic activity in society create attractive opportunities for employment in the legal sector (o increases), but since they also improve the wealth of other members of society, the size of the potential loot from crime also rises (b increases). However, based on past research the effect GDP has on employment is higher than increased benefits and therefore, the effect of increased GDP per capita (GDP) on the individual's decision to commit a crime should be negative. The effect of income inequality (GINI) in society should have a negative effect as well, depending on the individual's relative income position. In the case of the poor, an increase in inequality may be crime inducing, because such an increase implies a larger gap between the poor's wages and those of the rich, thus reflecting a larger difference between the income from criminal and legal activities. Therefore, a rise in inequality will have a positive impact on some individual's propensity to commit a crime. The Gini Index is measured by a decimal between 0 and 1, 1 meaning there is total equality. So as inequality rises, the number falls and GINI will have a negative sign.

Ehrlich (1973) considers the effects of unemployment on crime rates. The unemployment rate (UNEMP) can be viewed as a complementary indicator of income opportunities available in the legal labor market. Therefore, when unemployment rates increase, the opportunities in the legal labor sector decrease (o decreases).

B. Deterrence Variables

The strength of the police and the judicial system increases the probability of apprehension and the

punishment for criminal actions (p increases), thus reducing the incentive for an individual to commit a crime. This is the crime deterrence effect. It should also be noted that the past incidence of crime in society might determine an individual's perceived probability of apprehension via systemic interactions, as discussed above. The police rate (PLC), which is measured as the number of police per 100,000 residents, will be used as one of the variables to test the deterrence effect. To account for the "incapacitation" effect on criminals, I use the incarceration rates (INCAR) for prisoners, which is the number incarcerated per 100,000 residents. Incapacitation acts through the removal of a subset of convicted offenders from the market for offenses, by excluding them from the social scene for prescribed periods of time.

The individual's past experience in criminal activities is another important variable that affects in several ways the decision to commit a crime. First, convicts tend to have a limited amount of employment opportunities, and a lower expected income. Second, the theory that an individual learns by doing can apply to criminals as well, which lowers the costs of committing a crime. These arguments strongly suggest the possibility of criminal inertia, that is, present crime incidence explained to some extent by its past incidence. Therefore, I will include the lagged crime rate (LGRTE) variable as a measure of this effect. The lag accounts for the crime rate one year prior.

C. Demographic Variables

The last variable I use is the percentage of the population under the age of 25 (AGE). Criminologists view the change in the population age distribution as the greatest influence on crime trends. As a general rule, the crime rate follows the proportion of young males in the population. The number of juveniles should be increasing over the next decade, and some criminologists fear that this will signal a return to escalating crime rates. Thus, the age variable is expected to have a direct relationship with the crime rate. My empirical model, using the crime rate as a function of the above variables will look like this:

$$CRIME = b_1 + b_2 \ln EDC + b_3 \ln ENRL + b_4 \ln GDP + b_5 \ln GINI + b_6 \ln UNEMP + b_7 \ln INCAR + b_8 \ln PLC + b_9 \ln LGRTE + b_{10} \ln AGE \quad (2)$$

IV. Results

Results of the Linear-log regression using Crime per capita as the dependent variable are summarized in Table 2. Unfortunately, the only variable that served to be significant was the lagged crime rate. Due to the limitation on crime data available, there were only 38 cases recorded. Therefore, a degree of freedom problem is present, and the only way to fix it is to increase the sample size or decrease the number of variables. Due to the lack of available data, a decrease in variable number must occur. The decision on what variables to eliminate is based on another problem with the data. Specifically, EDC, ENRL, GDP, GINI, and INCAR all are considered trend variables. Therefore, a lack of variation within the variables occurs, and there are similar trends between all of them, which means the results will not be clear on the effects each variable has on the crime rate per capita. In addition, the lagged crime rate (LGRTE) may be picking up the influence of the other independent variables.

In order to test for all the effects, I chose one variable from each group, that would most fully represent that effect. The new model is:

$$\text{CRIME} = \beta_1 + \beta_2 \text{UNEMP} + \beta_3 \text{PLC} + \beta_4 \text{AGE} \quad (3)$$

The results of the second regression supported my hypotheses, although explaining less with an R^2 of .331

(see Table 3). The results of the AGE variable supported my hypothesis that an increased population of people between the ages of 14 and 25, increased the crime rate per capita. This means that the marginal effect of AGE on CRIME is increasing as AGE increases. The variable is significant to the .01 level. In the log-linear model the elasticity of Y with respect to X can be calculated using the following equation:

$$B_n/Y \quad (4)$$

Y is the mean value of CRIME, and B_n is the coefficient of the variable being tested. This calculation using the coefficient of AGE from equation 4, results in a 0.0161 elasticity of AGE with respect to CRIME. Meaning, there is a 1.6 percent increase in CRIME (crime per capita) with respect to a 1 percent increase in AGE (the percent of the population between the ages of 14-24).

The PLC variable is significant to the .01 level, and resulted in the expected sign. The elasticity of CRIME with respect to PLC, using equation 4, results in -0.0106. This translates into a 1 percent decrease in crime rates per capita with a 1 percent increase in the police ratio, as hypothesized. The UEMPL results in the expected sign, but unfortunately it is insignificant. The hypothesis is that an increase in unemployment would increase crime, through a decrease in the opportunities to earn money in the legal sector. However, the insignificant finding parallels that of Ehrlich's results.

In this paper, I argue that there are two particularly important areas for research on the economics of crime. First, the actual effect of deterrence on the level of crime continues as a central question for research. Although I was only able to test the effect of police rates on crime, there are other forms of deterrence that take place. Police rates test the probability effect in Becker's Rational Choice (equation 1), while a measure of the intensity of the punishment

TABLE 2
First Log-Linear Regression Results
(Adjusted $R^2 = .770$)

Variable	Coefficient	Significance
<i>Constant</i>	-.612	.103
Economic Variables		
<i>EDC</i>	.0888	.325
<i>ENRL</i>	-.002985	.936
<i>GDP</i>	.0424	.317
<i>GINI</i>	-.003117	.945
<i>UNEMP</i>	.002015	.778
Deterrence Variables		
<i>PLC</i>	.03105	.527
<i>INCAR</i>	-.0382	.038
<i>LGRTE</i>	.05608	.001
Demographic Variables		
<i>AGE</i>	.02547	.161

TABLE 3
Second Log-Linear Regression Results
(Adjusted $R^2 = 0.331$)

Variable	Coefficient	Significance
Constant	0.298	.006
AGE	0.02951	.011
PLC	-0.05721	.009
UNEMPL	0.005196	.211

would test the cost of crime. However, there are different levels of punishment depending on what kind of crime one commits. Future research would benefit from splitting the crimes into groups and testing each individually, so this variable could be included. Second, the levels of crime are not just determined by the level of deterrence. Indeed, in most studies deterrence is important but can explain at best a tiny fraction of the overall level of crime. In principle, social factors can explain significantly greater amount of the variance of crime across space. Due to data limitations, this study was only able to test the significance of being between the ages of 14- 24 as the social factor. But future research could include measures of effects such as divorce, abortion rates, or drug use. Research is increasingly attempting to understand these factors and find ways to test them.

The policy implications of this model are somewhat unclear. The fact that increased police ratios will decrease crime rates obviously implies that more police should be employed, especially in areas with more crime. The significance in the AGE variable implies that there should be policies to keep children between the age of 14-24 off the streets and out of crime. Programs could be set up in schools or communities attracting this group to other hobbies, such as art, music, or sports.

As crime has risen to the top of the theoretical ideas and empirical findings that can be translated into popular discourse and carved into public laws. Gary Becker (1968) crafted what was essentially an early principle-agent model of crime and punishment: criminals are rational, self-interested agents whose behavior is best understood as an optimal response to the incentives set by the government (or principal) via expenditures on law enforcement and corrections. In the years since, others have refined Becker's economic approach to the subject, including my own. My research developed a model in which criminals know that the probability of detection depends both on law enforcement monitoring and on the behavior of the community. The results imply that the decision to commit a crime is a cost benefit analysis, therefore future research should focus in on the population between the ages 14 – 25. Within this group the benefits of crime are the material items received from the act, or feelings of psychological empowerment, which is hard to measure. However, when turning to the costs of crime, one can look at the severity of the punishment, which includes fines and jail time, or the

probability of getting caught. The significance of the two variables on the cost side of the decision to commit a crime has different policy implications and would be important for future research.

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